

Dredging Operations and Environmental Research

... striking the balance

Environmental Windows

Real Problems and Potential Solutions

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Environmental Window - a period during which dredging may occur

Seasonal Restriction - a period during which dredging is not allowed

Schubel et al. 1979. A conceptual framework for assessing dredging/disposal options in Chesapeake Bay

“The greatest needs are to remove dredging and dredged material disposal from a crisis mode of management where special interests appear to dictate decisions. This requires...

- development of simple and effective management guidelines such as dredging windows...”

Schubel et al. 1979. A conceptual framework for assessing dredging/disposal options in Chesapeake Bay

“Open-water disposal operations are presently restricted to a dredging window that extends from October 1 to April 1. The window is based on currently best available data; it should be adjusted on the basis of future research to protect the environment and the biota at acceptable costs.”

Authorities for Windows

Federal Consistency Requirements

**Fish & Wildlife
Coordination Act**

**Clean Water
Act**

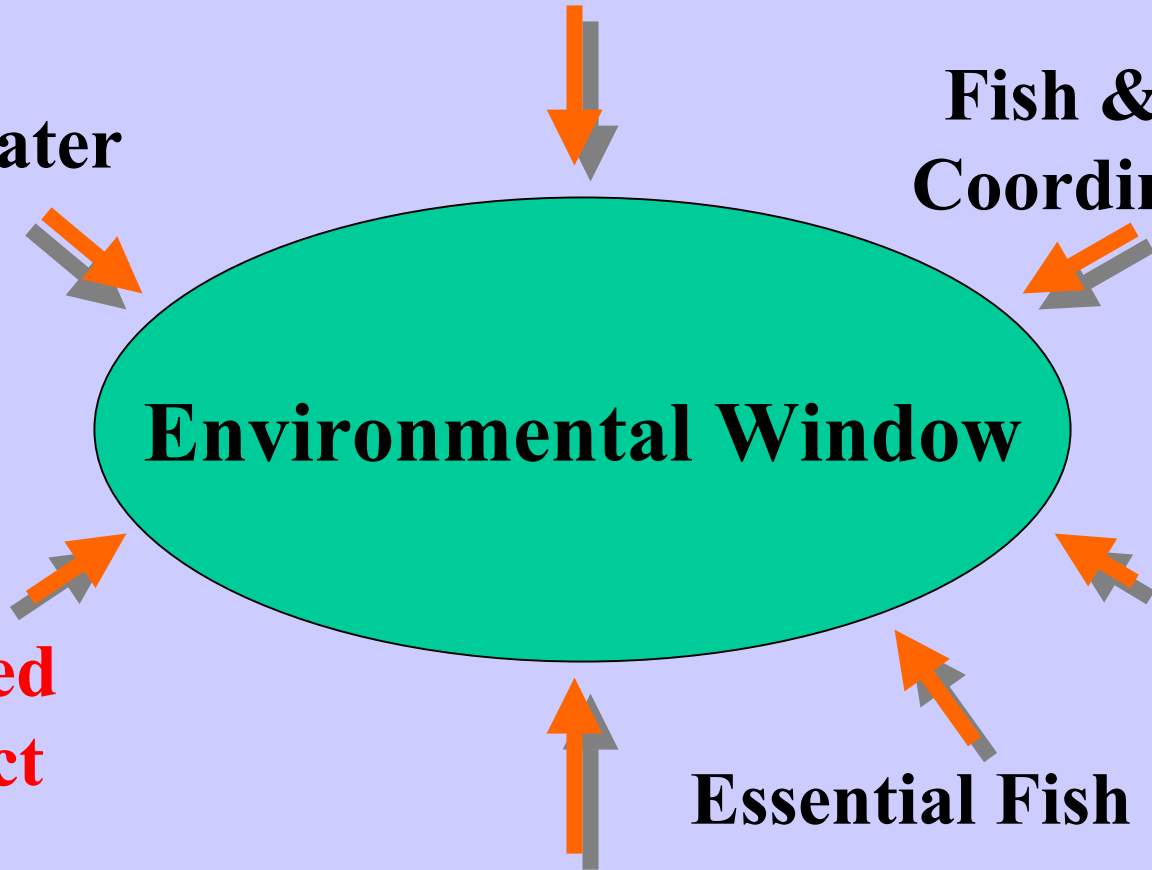
Environmental Window

**Biological
Opinions**

Essential Fish Habitat

Section 401 Water Quality Certification

**Endangered
Species Act**



Common Sense

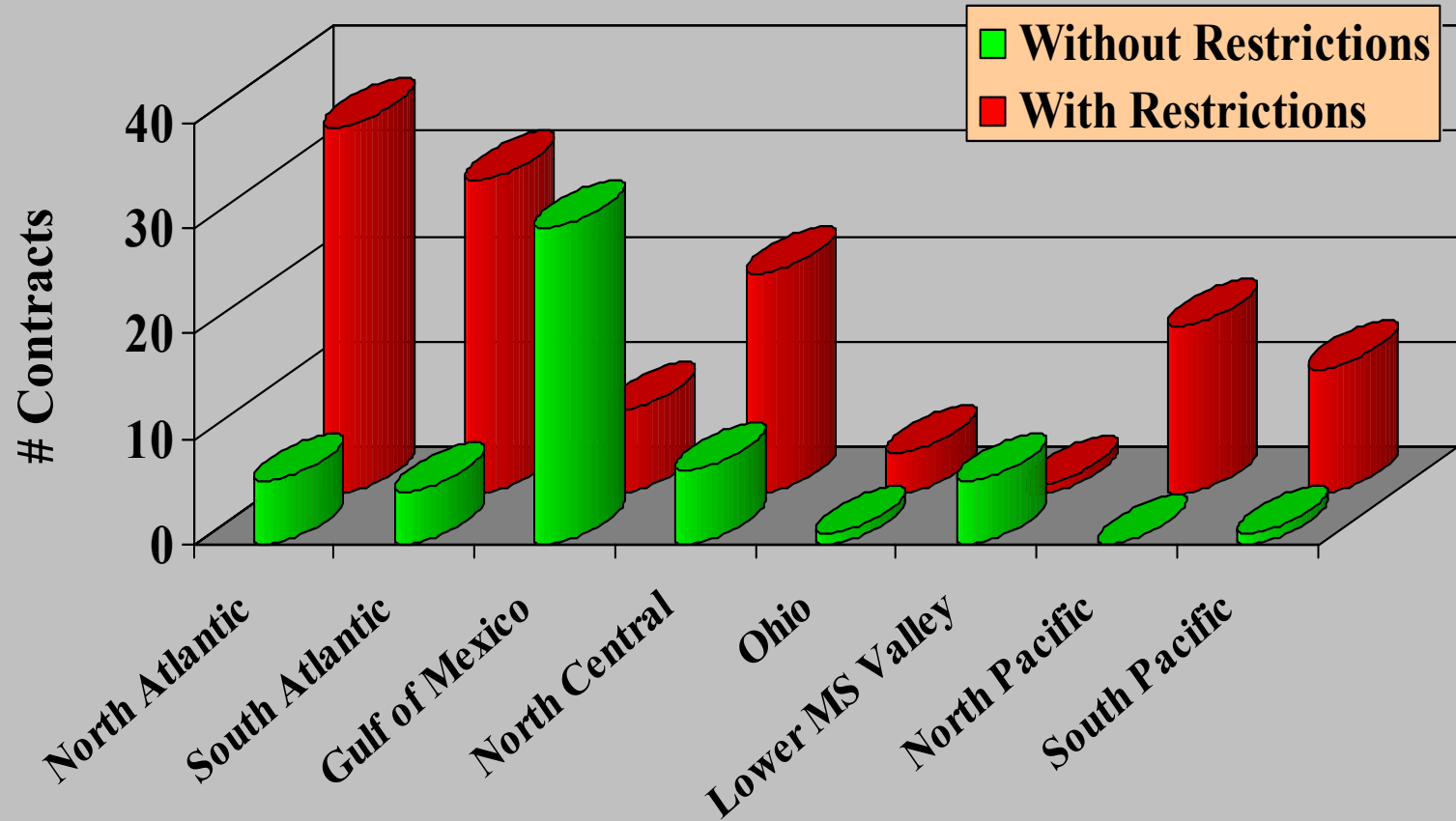
Versus

The Precautionary Principle

Or

**Upon Whom Lies the Burden of
Proof?**

Frequency of Windows by Region

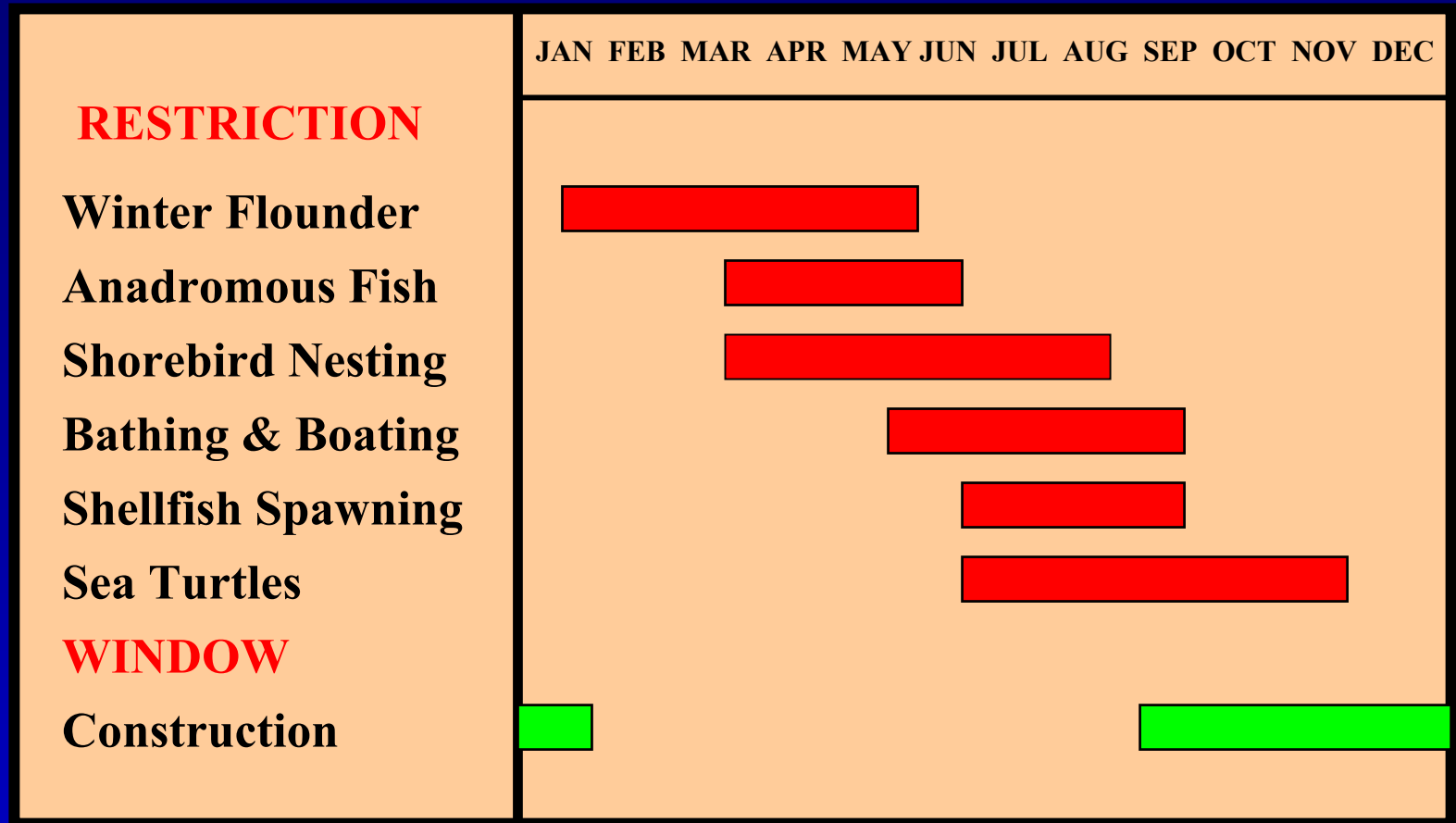


Windows Inflate Dredging Costs

- 150 to 200 million cubic yards are dredged annually under restrictions
- Reducing costs by \$0.01/cubic yard would accrue an annual savings of >\$1.5 million
- Research leading to flexible windows or alternative operational measures offers a substantial ROI

CUMULATIVE WINDOWS

EXAMPLE: HYANNIS HARBOR, MA PROJECT FILE



JANUARY 1992

STATE OF MICHIGAN PREFERRED DREDGING PERIODS

(Based on Critical Spawning, Migration, and Extensive Recreational Use Periods)

COMPILED BY: U.S. ARMY CORPS OF ENGINEERS - DETROIT DISTRICT - PROJECT OPERATIONS SECTION

Preferred Dredging Periods = XXXXXXXXXX

LAKE MICHIGAN

PROJECT	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
ARCADIA												31
CHARLEVOIX			31			1		31				1
FRANKFORT			31		15			15				1
GREILICKVILLE			31		1			15				1
GRAND HAVEN (INNER)				15						1		*
GRAND HAVEN (OUTER)				15						1		*
GRAYS REEF PASSAGE			31				15		31			1
HOLLAND (INNER)				15						1		*
HOLLAND (OUTER)				15						1		*
LITTLE BAY DE NOC			31		1			15				1
LELAND				31								1
LUDINGTON			31		15		15					1
MANISTEE			31		1		15					1
MANISTIQUE			31			15		31				1
MENOMINEE			31			15		31				1
MUSKEGON			31		1		15				15	
NEW BUFFALO		28			15	30						#
PENINWATER			31	1	15							1
PETOSKEY			31		1			31				1
PORTAGE LAKE			31		1			15				1
SAUGATUCK			31			1		31			1	
SOUTH HAVEN						1		31				
ST JAMES				15				1				
ST JOSEPH (INNER)		28			1	30						1
ST JOSEPH (OUTER)		28			1	30						1
WHITE LAKE			31		1			15				1

NO DREDGING ALLOWED DURING HOLIDAY WEEKENDS, OTHERWISE, WEEKEND DREDGING ALLOWED EXCEPT AS NOTED BELOW:

* = NO MECHANICAL DREDGING ALLOWED ON WEEKENDS

= NO WEEKEND DREDGING ALLOWED

△ = NO WEEKEND DREDGING ALLOWED DURING JUNE

LAKE MICHIGAN WINDOWS

Detroit District

Issues That Lead to Windows

- **Sediment re-suspension effects**
 - **Turbidity**
 - **Total Suspended Solids**
- **Hydraulic entrainment**
- **Sedimentation effects**
- **T&E species protection**

Informed Decisions Demand an Integrated Approach

- ***Biology***

- Life history stage
- Habitat
- Seasonality
- Vulnerability

- ***Dredging***

- Type
- Performance
- Waterway
- Temporal/Spatial Scales

James River, VA Dredging Study

Effects of plumes on migratory fishes



James River, VA Dredging Study

- Interagency mtg - Oct 1998
- Interagency mtg - Jan 1999
- Interagency mtg - Jul 1999
- Dredge yes, fish no field demo - Sept 1999
- Interagency mtg - Feb 2000
- Dredge no, fish yes field demo - Apr 2000
- VA Marine Resources Commission mtg – August 2000
- Interagency mtg – Jan 2001
- Interagency mtg – June 2001
- Interagency mtg – Oct 2001
- James River Partnership mtg – April 2002
- Dredge yes, fish yes field study - ?????

Part of the Problem

Concerns Not Prioritized

Life History Stage	Suspended Sediments	Turbidity	Entrainment
Eggs	Moderate	NA	High
Larvae	High	Low	Low
Juveniles	Moderate	High	Moderate
Adults	Low	Moderate	NA

Making Progress?

- **Great Lakes Dredging Team and Great Lakes Fishery Commission are attempting a regional approach**
 - **Windows Advisory Team**
 - **States and Corps Districts**
 - **Step 1: Prioritization of concerns**
 - **Step 2: Identify most problematic windows**
 - **Step 3: Identify opportunities for collaborative research**

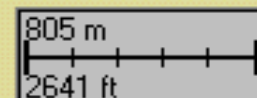
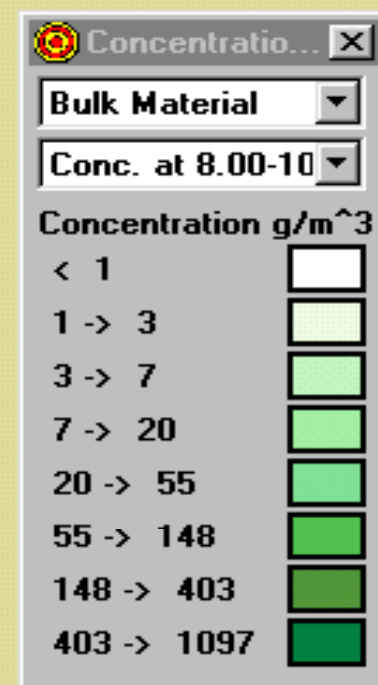
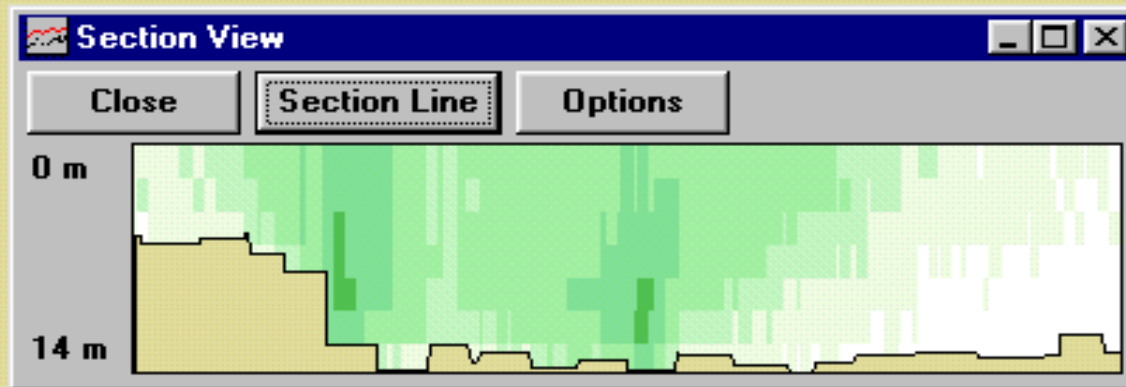
Development of Negotiation Tools

- **Windows decisions are frequently based on hypothetical concerns, assumptions, and gut reactions rather than objective data**
- **Given the number of dredging projects and spectrum of concerns, the situation is likely to persist**
- **This suggests that modeling and risk management approaches are appropriate**
- **DOER research is attempting to fill the gap**

Models

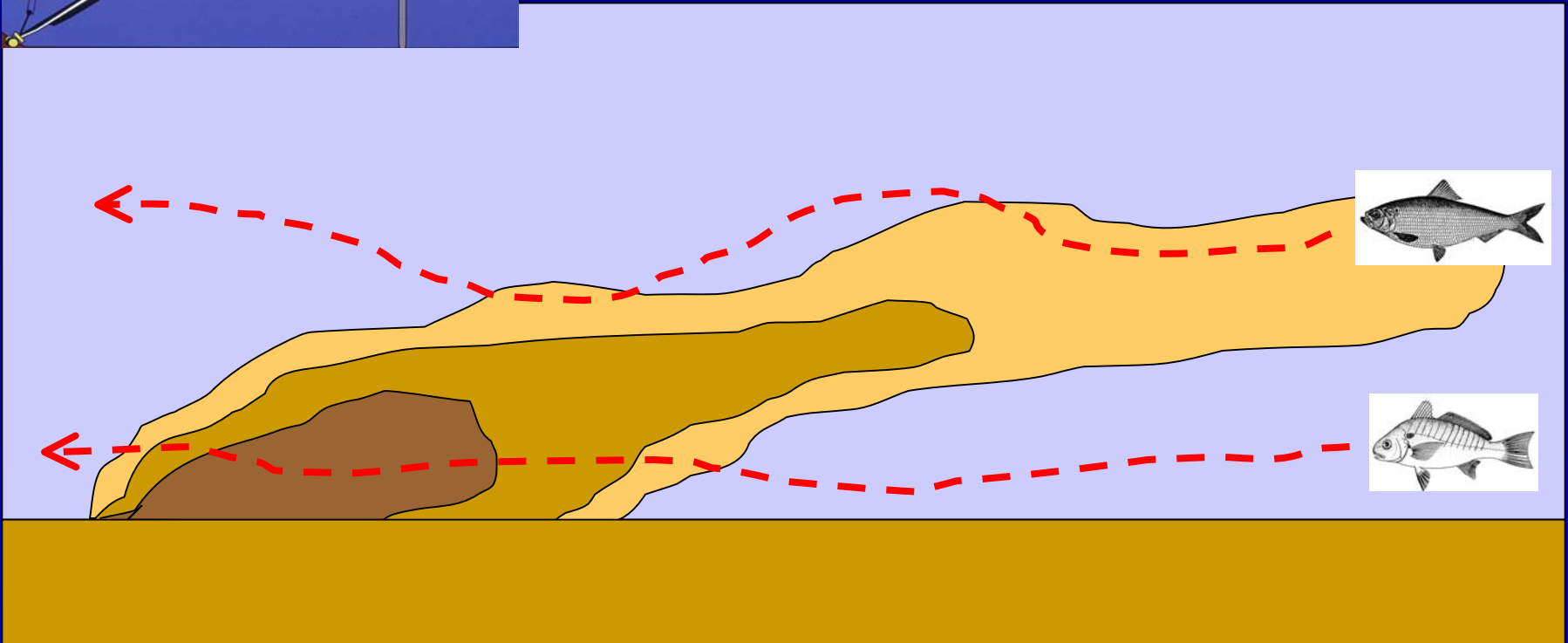
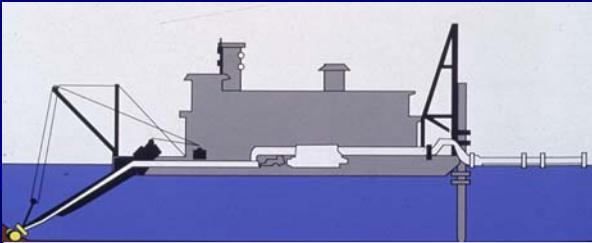
- **Customized to Simulate a Broad Range of Dredging Scenarios**
- **Fast, PC-based**
- **Inexpensive**
- **Adaptable (Low or High End)**
- **Exploratory**

SSFATE

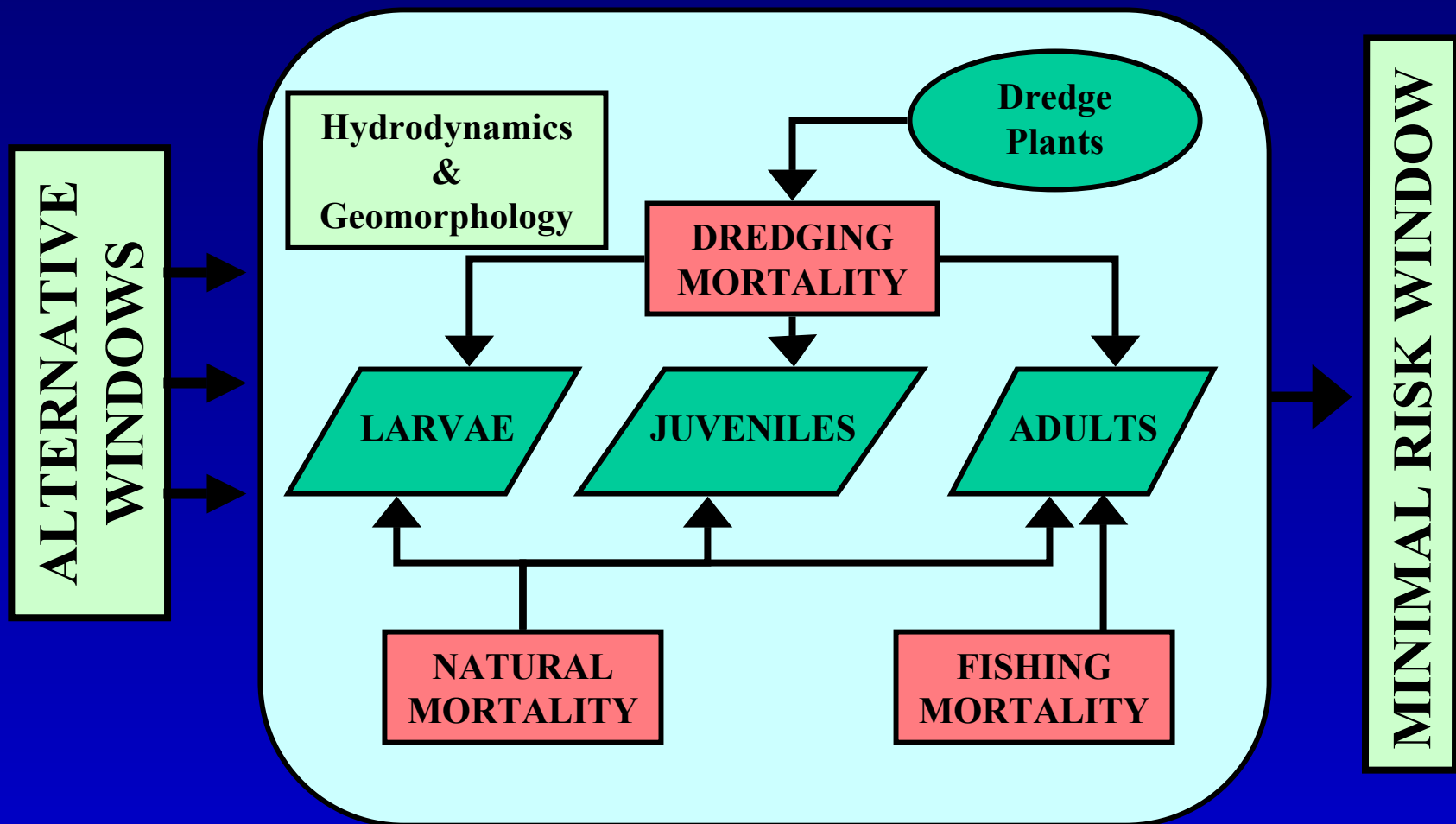


SSDOSE

Calculation of dose (mg hr L^{-1})

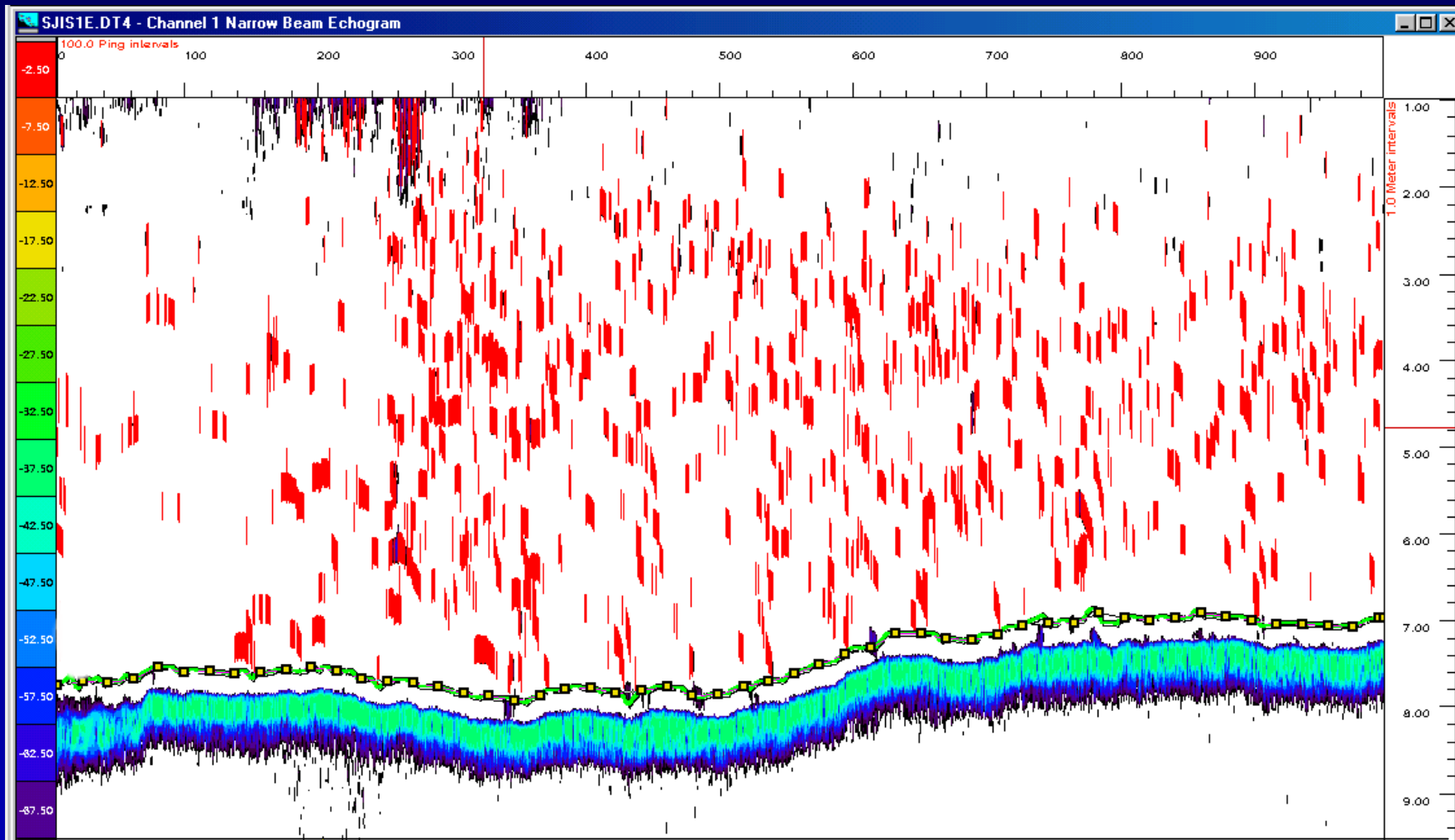


FISHFATE: A POPULATION DYNAMICS MODEL



Window Evaluation Tools

- **Acoustic technologies**
 - ADCP currents and backscatter
 - Fishery hydroacoustics
- **On-site lab module for exposure/
response studies**
- **Tagging/telemetry technologies**



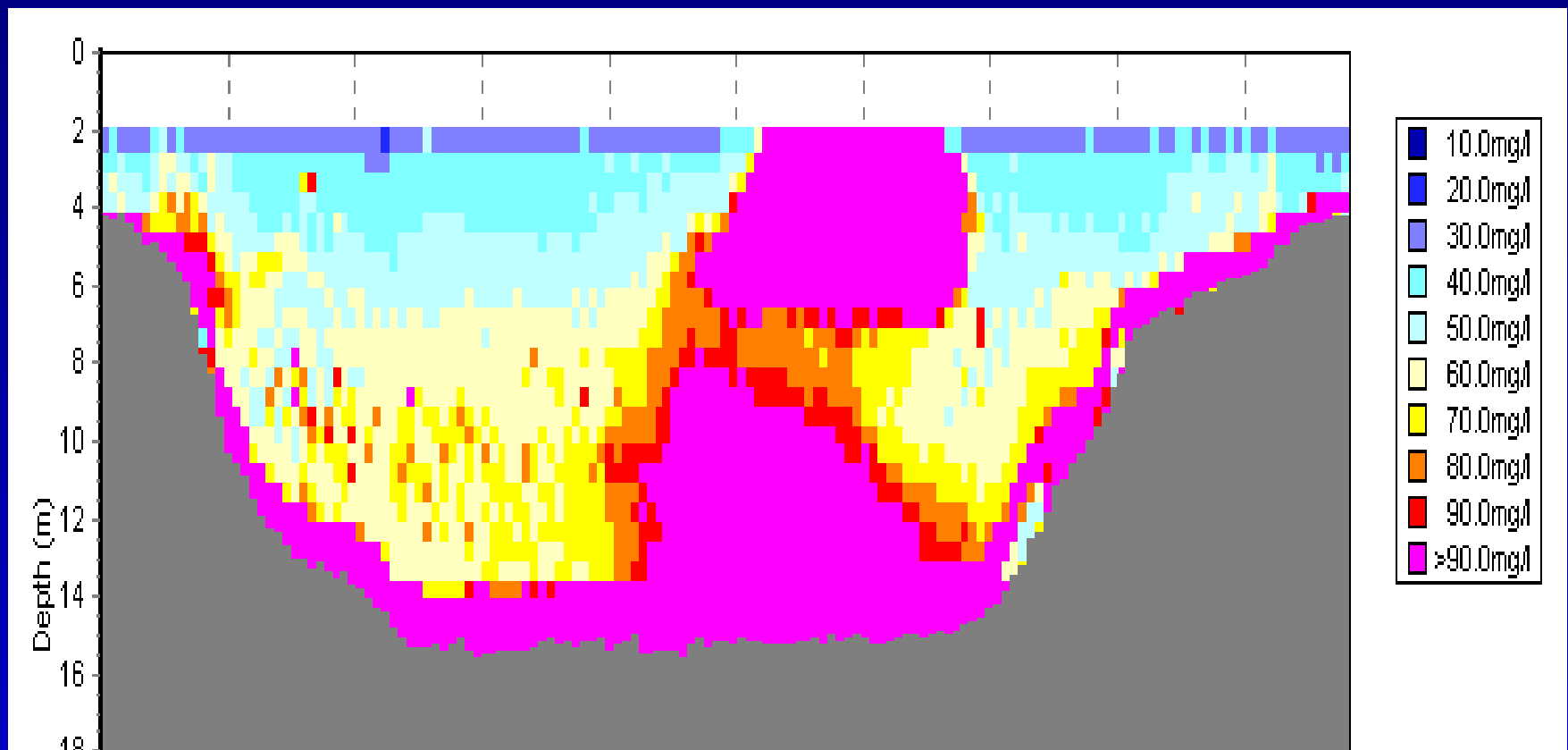
30 m

DREDGE LOCATION

Suspended Sediment Plume



Acoustic Characterization of Suspended Sediment Plumes



Environmental Windows

Field Studies

- **Entrainment - Detroit District**
- **Shad, James River, VA - Norfolk District**
- **Bucket Dredge Sounds - Anchorage District**
- **Shad, Christina River – Philadelphia District**
- **Bucket Dredge Plumes – Baltimore District**
- **Riverine Disposal – Baltimore District**
- **Pipeline & Hopper Dredge Sounds – Mobile District**
- **Winter Flounder – New York and New England Districts**

National Research Council

**A Process for Setting, Managing, and
Monitoring Environmental Windows**



www.wes.army.mil/el/dots

